CLAIMS

What is claimed is:

1. A composition comprising:
at least one vinyl-terminated silicone oil;
at least one conductive filler; and
at least one hydrogen terminated silicone;
the composition being a curable and thermally conductive material.

2. The composition of claim 1 further comprising at least one silicone crosslinker to form a gel thermal interface material with low modulus.

3. The composition of claim 2 wherein a mole fraction of equivalents of silicone hydrogen bond (Si-H) provided by the hydrogen terminated silicone oil to a total equivalents of Si-H provided by both the silicone crosslinker and the hydrogen terminated silicon oil is at least 0.4.

4. The composition of claim 2 wherein the silicone crosslinker is a random co-polymer comprising at least three silicone-hydrogen bonds (Si-H).

5. The composition of claim 1 wherein a molar ratio of Si-H equivalents to Si-vinyl equivalents is in a range of approximately 2 to 0.6.

6. The composition of claim 5 wherein the ratio is approximately 1.

7. The composition of claim 1 wherein the conductive filler is one of aluminum, silver, copper, aluminum nitride, aluminum oxide, zinc oxide, boron nitride, aluminum nitride, silver coated copper, silver coated aluminum, and carbon fibers, and alloys and mixture thereof.

8. The composition of claim 1 wherein the conductive filler has a particle size of less than 300 microns.

9. The composition of claim 1 further comprising at least one catalyst for curing reaction.

10. The composition of claim 9 further comprising at least one coupling agent for the filler.

11. The composition of claim 9 further comprising at least one adhesion promoter.

12. A method comprising:

combining at least one vinyl-terminated silicone oil, at least one conductive filler, and at least one hydrogen terminated silicone oil to form a curable thermal interface material (TIM).

13. The method of claim 12 further comprising combining a silicone crosslinker to form a gel thermal interface material with low modulus.

14. The method of claim 13 wherein a mole fraction of equivalents of silicone hydrogen bond (Si-H) provided by the hydrogen terminated silicone oil to a total equivalents of Si-H provided by both the silicone crosslinker and the hydrogen terminated silicon oil is at least 0.4.

15. The method of claim 13 wherein the silicone crosslinker is a random co-polymer comprising at least three silicone-hydrogen bonds (Si-H).

16. The method of claim 12 wherein a molar ratio of equivalents silicone-hydrogen bonds (Si-H) to equivalents of silicon-vinyl bonds (Si-vinyl) is in a range of approximately 2 to 0.6.

17. The method of claim 12 wherein the ratio is approximately 1.0.

18. The method of claim 12 wherein the conductive filler is one of aluminum, silver, copper, aluminum nitride, aluminum oxide, zinc oxide, boron nitride, aluminum nitride, silver coated copper, silver coated aluminum, carbon fibers, alloys and mixtures thereof.

19. The method of claim 12 further comprising combining at least one catalyst for curing reaction.

20. The method of claim 19 further comprising combining at least one coupling agent for the filler.

21. The method of claim 19 further comprising combining at least one adhesion promoter.

22. A processor assembly comprising:
a semiconductor device;
a heat spreader coupled to the semiconductor device;
a first curable thermal material between the semiconductor device and the heat spreader to provide thermal resistance, the first curable thermal material comprising:
at least one vinyl-terminated silicone oil;
at least one conductive filler; and
at least one hydrogen terminated silicone oil;
a thermal element coupled to the heat spreader; and
a second curable thermal material between the heat spreader and the thermal element, the second curable thermal material comprising:
at least one vinyl-terminated silicone oil;
at least one conductive filler; and
at least one hydrogen terminated silicone oil.

23. The processor assembly of claim 22 further comprising:
a substrate coupled to the semiconductor device; and
an interposer coupled to the substrate.

24. The processor assembly of claim 23 further comprising:

a first plurality of solder bumps coupling the substrate to the semiconductor device; and

a second plurality of solder bumps coupling the semiconductor device to the substrate.

25. The processor assembly of claim 23 further comprising:

a plurality of pins extending outwardly from the interposer.

26. The processor assembly of claim 22 wherein the first and second curable material further comprises at least one silicone crosslinker to form a gel thermal interface with low modulus.

27. The processor assembly of claim 26 wherein a mole fraction of equivalents of silicone hydrogen bond (Si-H) provided by the hydrogen terminated silicone oil to a total equivalents of Si-H provided by both the silicone crosslinker and the hydrogen terminated silicone oil is at least 0.4.

28. The processor assembly of claim 26 wherein the silicone crosslinker is a random co-polymer comprising at least three silicone-hydrogen bonds (Si-H).

29. The processor assembly of claim 22 wherein a molar ratio of Si-H equivalents to Si-vinyl equivalents is in a range of approximately 2 to 0.6.

30. The processor assembly of claim 22 further comprising:

a substrate coupled to the semiconductor device; and

a plurality of pins extending outwardly from the substrate.